

Chapter 6

PageRank Algorithm– Based Recommender System Using Uniformly Average Rating Matrix

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ABSTRACT

Applications of web data mining is the prediction of user behavior with respect to items. Recommender systems are being applied in knowledge discovery techniques to the problem of making decisions on personalized recommendation of information. Traditional CF approaches involve the amount of effort increases with number of users. Hence, new recommender systems need to be developed to process high quality recommendations for large-scale networks. In this chapter, a model for UAR matrix construction method for item rank calculations, a Page Rank-based item ranking approach are proposed. The analysis of various techniques for computing item-item similarities to identify relationship between the selected items and to produce a qualified recommendation for users to acquire the items as their wish. As a result, the new item rank-based approaches improve the quality of recommendation outcome. Results show that the proposed UAR method outperforms than the existing method. The same method is applied for the large real-time rating dataset like Movie Lens.

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1. INTRODUCTION

Most of the real world applications use the web. Web mining is one of the techniques of Data mining – a process of extracting knowledge or information from large volume of data. Web mining concept is broadly divided into three groups namely Web Content Mining, Web Usage Mining and Web Structure Mining.

Web Content Mining is the process of discovering interesting knowledge from the contents of the web documents. The content may have text, images, audio, video, or structured records.

Web Usage Mining is the process of extracting interesting usage pattern from the web data.

Web structure mining is the process of extracting structure information from the Web. This type of mining uses some of the concepts of graph theory. The structure of a typical web graph consists of web pages as nodes, and hyperlinks as edges connecting related pages. Based on the type of structure information used, it can be further divided into hyperlinks and document structures. Here our focus is only on Web Structure Mining (Srivastava et al., 2005).

Web Structure analysis was first done by Larry Page and Sergey Brin who were the doctoral students of Stanford University, introduced the famous PageRank algorithm (Brin & Page, 2012) for performing link analysis of web pages for web search. It is the heart of Google search engine. Initially, the algorithm was designed to find out the significance of web pages over the web by allocating the rank score. Later, the applications of page rank expanded to some other areas which include rating as an important factor. The notable applications related to ratings are: movie ratings, product ratings for online shopping, article ratings, health recommendations, social networking and many more business applications. Those systems support user to attain a satisfactory thing or item which is fit for their requirements. More over recommender systems provide suggestions in some other applications like share market, medical suggestions, hotel/restaurant bookings, music, web pages, search queries in the web and etc.,. There are various recommendation systems available, namely MovieLens, Netflix, Jester, eBay and Amazon (Gao, Wu, & Jiang, 2010) The purpose of page rank is to rank any products or web pages which finally provide valid recommendations to the user.

Personalization is known to be an important factor in recommendation system. It is the facility to make content and services always available, which can be customized to each individual users according as their personal liking behaviors (Gao, Liu, & Wu, 2010; Gao & Wu, 2010; Gao, Wu, & Jiang, 2011). Personalized recommendation system is applied in several academic services including digital libraries, e-learning, news filtering, e-commerce, and search engine domains and applications (Gao, Liu, & Wu, 2010). Recommendation system uses Collaborative Filtering (CF), an important concept, to collect and evaluate large amount of data based on the user selection (Zhao et al., 2016; Barbieri et al, 2011). An extension of CF model, a new recommendation engine (Lee, Kuo, & Lin, 2016) was developed to work with course recommendation. The proposal merged a two stage CF representation regularized by course dependency with a graph based recommender support. According to this paper the students are considered as users and the courses are considered as items.

Graph theory can be applied for web page ranking since the web can be related to a graph with nodes and edges. Here the nodes are considered as web pages and the link between web pages are considered as edges (Abedin & Sohrabi, 2009). There are several web link structure evaluation approaches were discussed like cognitive walk through for web, markov chains, survey methods, graph theory. Graph theory concept has been used in collaborative ranking to rank items founded on the consistent recommendation paths (Shams & Haratizadeh, 2017). An iterative network-oriented approach for collaborative ranking

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